clouds of invasion; rain and hail. IX. Unstable conditions. X. Two layers of clouds in the same zone. XI. General circulation.

THE CLIMATE OF ATHENS.

The study of local climatology is not as yet pursued in the United States with that detail and thoroughness that characterizes European memoirs. Although some of our older voluntary observers and many of our Weather Bureau stations have by this time accumulated the necessary data, and although the records for some stations, such as Pike's Peak and Colorado Springs, the Dudley Observatory at Albany, and the Central Park Observatory in New York, have been published *in extenso*, yet there is still wanting a discussion of these observations in all their bearings on meteorology, hygiene, agriculture, navigation, and engineering which shall serve as a model treatise on the climate of some American station. Such a model memoir bearing on the climate of Athens has, however, lately been published by Professor Demetrius Eginitis, Director of the National Observatory, in that city, and forms a part of the first volume of its annals. The handsome typography that distinguishes this volume above the ordinary meteorological publications is eminently appropriate to the classic nature of the subject, for we have here for the first time presented a complete picture of the climate of a region whose history and art, ethnology and science have been familiar to the civilized world from time immemorial. We have now for the first time the data needed to carry out investigations into the possible relations between the climate and the development of mankind and the arts that accompany civilization. This latter study, if there be anything in it, we must leave to others, but the general contents of Eginitis' work on the climate of Athens we may give at length as suggesting what may well be done for many American cities. The technical meteorological records which have been summarized in this volume are those by Peytier in 1833–1835; by Fraas, 1836–1841; by Vouris, 1839–1847; Papadakis, 1853–1857; Schmidt, 1858–1884; Kokkidis, 1884–1889; Eginitis, 1890–1896. Since 1847 most of these observations have been made at the Observatory of Athens and many of them have been published, more or less completely, by private enterprise. In fact, many of the original records, having been purchased by Germany, are now deposited for safe keeping in the fireproof buildings at Potsdam. After a brief description of the present topography of the city and its surroundings, and the changes that have taken place, as shown by quotations from classic authors, the director of the observatory publishes fourteen chapters treating successively of atmospheric pressure, temperature, humidity, wind, rain, snow, hail, dew and frost, haze and fog, cloudiness, thunderstorms, evaporation, optical phenomena, temperature of the soil and the water, and the Arago actinometer. Each of these chapters opens with a charming sketch of the ideas and the knowledge that have come down to us from the ancient Greeks relative to the subject in hand and it would surprise the modern scientist to see how near the truth the ancient philosophers attained in respect to many subjects that have only become clear to us since the days of Galileo and experimental philosophy.

The barometric pressures are given by decades and by months deduced from the thirty-six years, 1858–1893, and the results compared with the isobars of Teisserenc de Bort. The monthly and mean annual pressures are given for each hour of observation, 8 a. m., 2, and 9 p. m., as well as the extreme barometric readings for each month during these fifty-four years. The variability of the climate, as represented by the amplitude of the normal variation of pressure between two consecutive daily readings at 2 p. m., is shown by the study of the last fifteen years. The variability is decidedly less that for Paris or Perpignan. This is contrary to the ordinary opinion that the climate of Athens is more variable than the climate of Paris and it is shown that the reason lies in the fact that the atmospheric variations at Athens are frequent but not very decided, whereas, at Paris they are less frequent but much greater. At Athens the weather varies sometimes in the course of the day and even in a few hours, but these habitual variations are small, whereas, at Paris the same kind of weather lasts for a longer time but the disturbances are ordinarily more extensive than at Athens.

The chapter on temperature treats that subject with even more elaboration, occupying forty pages of the volume, and concludes with data illustrating the variability of the climate, especially by the fact that the same date palms and other plants flourish to-day in the same places and to precisely the same extent that they did in antiquity. This was then, as now, the limiting climate, in which the palm occasionally, but not regularly, ripened its fruit. A change of 1° C. would, apparently, have made an appreciable improvement in the cultivation of this fruit, so that, as the author says, it is not likely that the normal annual temperature has changed by this amount in two thousand or three thousand years.

The observation of the humidity of the air by means of the hair hygrometer began in 1839, and the discussion of this subject occupies twenty-four pages of the third chapter, preceded, as usual, by quotations from Aristotle and other classic authors. The winds and general cloud phenomena could be observed by the ancients as well as by the moderns, and the quotations from classic authors are arranged in the fourth chapter, which occupies about thirty pages, in connection with the author's more elaborate discussion of each phase of this subject, viz, the relation of the winds to clouds, rain, thunderstorms, humidity, temperature, pressure, diurnal and annual frequency. The strongest wind at Athens is from the northeast, next to that, the south, and the feeblest wind is from the east. The maximum force of the south wind during the period of accurate observation has sometimes attained 20 to 30 meters per second, and on the 26th of October, 1852, such a south wind overturned one of the columns of the temple of Jupiter Olympus at Athens.

The rainfall is discussed in the fifth chapter, in about thirty pages of text. Even the ancients understood that rain was in some way produced by the condensation of aqueous vapor from the atmosphere, and knew that the quantity of water which falls upon the neighboring mountains, such as Parnassus and Hymettus, was far greater than that which fell at Athens. Although Athens is subject to very long and severe droughts, yet the actual rainfall for successive decades does not vary very much. The normal number of rainy days in any month varies from 1.5 in August, 2.9 in July, to 13.5 in December. The prognostics of rain at Athens have been observed from classic times. Whenever Hymettus is seen covered with clouds, it is considered very probable that it will rain. This often fails, but it is verified often enough to maintain the belief in its efficacy. The altitude of Hymettus is about 1,027 meters; consequently, when clouds are seen around its summit, these can scarcely be the upper cirrus or the medium cirro-cumulus, but must necessarily be the lower clouds—cumulo-stratus or cumulo-nimbus. Such a mountain must, therefore, be considered as a hygrometer that indicates the altitude and nature of the clouds. The connection between rain and the local topography, on the one hand, and the general meteorology of Europe, on the other, is discussed, with a view to explaining the general conditions that cause rain.